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## GEOGRAPHICAL RECORD

### AMERICAN GEOGRAPHICAL SOCIETY

**New Fellows of the Society; Meetings of March and April.** A regular monthly meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday evening, March 21. President Greenough presented by name the following persons, recommended by the Council for election as Fellows, and after a vote they were declared elected:

Donald S. Birkett

Albert H. Chamberlain

Leslie E. Coffin

Mr. B. R. Baumgardt, a member of the Southern California Academy of Sciences, then addressed the Society on "Sweden."

An extra inter-monthly meeting was held on March 14 at which Leo Wiener, Professor of Slavic Languages and Literatures at Harvard University, spoke on "Russia."

At a regular monthly meeting of the Society held on Tuesday evening, April 25, the following persons were duly elected Fellows of the Society:

Henry M. Ami  
Mrs. Ralph Boyce  
Frank G. Carpenter  
Percy D. Dwight  
Raymond B. Earle  
Frank Roy Fraprie

John W. Frothingham  
George M. Garland  
Roy Garland  
Lindley M. Garrison  
Philip W. Henry  
William Sargent Ladd

Lionel Sutro

Mrs. Harriet Chalmers Adams then addressed the Society on "The Philippines and the Sulu Sea."

At an extra inter-monthly meeting on April 11 Prof. J. Paul Goode, of the department of geography of the University of Chicago, spoke on "The Geographic and Economic Influences in the Great War." Professor Goode explained the geographic causes underlying the present war and, in the form of lantern slides, illustrated his address by means of a large number of ethnographic and other maps and graphs summarizing economic statistics.

### NORTH AMERICA

**The Oasis of Tuba, Arizona.** South and east of the Colorado stretches the Painted Desert, wind-swept, desolate, beautiful in its fantasies of bare rock, color, and wind-carved form. In its vast expanse is only one spot where a reliable supply of drinking water may be found and where a corn crop is assured. This spot is the Tuba oasis ("The Oasis of Tuba, Arizona," by H. E. Gregory, *Annals Assoc. Amer. Geogrs.*, Vol. 5, 1915, pp. 107-119). For centuries Tuba has been a meeting point of routes, a goal and wayside station for many peoples. Its first known inhabitants were the Kisani, ancestors of the modern Hopi, who probably occupied it as an outpost from the Tusayan pueblos. Following the usual custom of the desert these agriculturists were driven out by the nomad hunting tribes from the north, Piute and Navajo. In the mid-seventeenth century the first Spanish explorers arrived. They found the oasis in a state of intermittent cultivation by Hopi farmers creeping cautiously from the nearest pueblo, Oraibi. Long afterwards pioneer bands of Mormons passed through on the route from Salt Lake City. In 1878 they made a permanent settlement, though at the time of foundation the Santa Fé railroad had not been built and all supplies had to be brought over weary trails, 450 miles from Salt Lake City or 370 miles from Albuquerque. Drought and Navajo attacks prevented the little colony from becoming prosperous. Since 1903 Tuba, purchased for the Indian Affairs Office, has become the seat of a government agency and a safe harbor for the old age of the Hopi race. In 1914 over two hundred of the fast-declining tribe have taken up permanent residence at the oasis, and the number is greatly increased during the summer.

In Tuba geographic relationships find one of their simplest expressions. Climate is fate. Its control over vegetation and thus over man is absolute. Hopi civilization was essentially based on Hopi corn (see "The Navajo Country: Part II, The People,"

by H. E. Gregory, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 652-672). Of the 150 species of plants indigenous to the region, 144 have been put to practical use by this people, and all are known by name. The climate, characterized by its intense local variations, both in temperature and rainfall, is primarily dependent on elevation and exposure. The average precipitation for the period of continuous measurement from 1909 to 1913 is 7 inches, but this is a wet period compared with "the great drought" of 1900 and 1901. Most of the precipitation falls in the winter months. July, following the three driest months, is the crucial month. Corn grown without irrigation can only mature with a July rainfall more generous than the average. But Tuba has means of irrigation. Surface erosion and vertical cutting in the Moenkopi canyon walls have brought springs and water-bearing layers within reach. The water supply of the Moenkopi has actually been notably increased within recent years. The entrenched stream has cut through its alluvial floor to bedrock and augmented its flow by 600 to 800 per cent from 1878 to 1903. On the other hand a minor loss has been sustained through the burial of springs by shifting dunes. On the irrigated school lands of Tuba itself, about 40 acres, and on those of the Moenkopi canyon floor, about 1,000 acres, the Hopis raise surprisingly good crops of corn, wheat, alfalfa, vegetables, and fruit. With the agricultural produce and flocks they are self-supporting and content.

**A Remarkable Fall of Hail in Maryland.** Exaggerated reports of the sizes of hailstones are frequently met with, and careful investigation of such reports should, whenever possible, be made immediately after the storm and in the locality where the storm occurred. What was clearly an unusual fall of hail occurred in Maryland on June 22, 1915, and has been critically studied by Prof. Oliver L. Fassig, of the U. S. Weather Bureau (*Monthly Weather Rev.*, 1915, pp. 446-448). Fortunately, the largest hailstones fell in and about Annapolis, where many measurements of the stones were made. Ten or twelve stones, accurately measured by two officials of the U. S. Naval Academy, gave an average diameter of  $3\frac{1}{2} \times 3$  inches, with a maximum major diameter of  $3\frac{15}{16}$  inches. These and other measurements show that the largest hailstones had a circumference ranging from 10 to 12 inches. Obviously, the popular reports of hailstones of "the size of a baseball or an orange" were not greatly exaggerated (a "league baseball" measures 9 inches in circumference). Many of the larger hailstones weighed about as much as a baseball (5 ounces). In some of the larger stones, from twenty to twenty-five concentric layers of opaque and transparent ice were counted. There were only two reports of personal injuries, both of them very slight. Skylights of glass  $\frac{5}{16}$  inch thick, with embedded wire netting, were broken.

In his "Lehrbuch der Meteorologie," von Hann cites occurrences of hailstones measuring from 4 to 6 inches in diameter and weighing over a pound. In India, Eliot found that 22 per cent of 600 hailstones measured were larger than a lemon. Another investigator, Buist, found the mean maximum circumference of Indian hailstones to be from 4 to 6 inches; the largest were 10 to 13 inches in circumference, and weighed from slightly over half a pound to one pound and a quarter.

R. DEC. WARD.

**The Subdivision of the United States into Physiographic Provinces.** The inception of the important undertaking of providing a standard subdivision of the United States into physiographic provinces which has just been achieved with such marked success is related by F. E. Matthes in the latest issue of the *Annals of the Association of American Geographers* (Vol. 5, 1915, pp. 127-129). The presentation of various related papers at the Princeton (1913) and subsequent meetings of the Association showed that the matter was ripening to expression. Accordingly, at the Chicago meeting (1914) a "round table" conference was held at which Professor Nevin M. Fenneman of the University of Cincinnati, who had presented an important paper on "Physiographic Boundaries within the United States" the year before, presided. The first part of the discussion served to clarify ideas as to the scope of the work contemplated. While the importance of the "natural region" in systematic regional geography was recognized, it was felt that its composite nature—based, as it is, on a combination mainly of the three elements of relief, climate, and vegetation—makes it rather a matter for the individual investigator to determine, according to the purposes of his inquiry. A physiographic province, on the other hand, is a unit of a single kind, susceptible of more or less precise delimitation. The conference accordingly decided that the physiographic province, i. e. an area that throughout its extent has had essentially the same geomorphologic development, was the unit to be used in the subdivision of the United States. After discussing a number of topics such as the size and rank of provinces and their subdivisions, the character of the boundaries and the best mode of representing them on a map, the conference proceeded to a partition of the North American continent into its primary divisions. None of the questions at issue was definitely settled, nor was it the

object of the conference to undertake to settle them; but the nature and spirit of the discussions and the general feeling of harmony that prevailed guaranteed the success of the plan. The conference accordingly ended by passing a resolution recommending to the Council of the Association the appointment of a committee to undertake the preparation of a map of the physiographic provinces of the United States.

The committee appointed consisted of the following members: Nevin M. Fenneman, chairman; Eliot Blackwelder; Marius R. Campbell; Douglas W. Johnson; and François E. Matthes. At the Washington meeting of the Association in December, 1915, it was reported (see February *Review*, p. 136) that final agreement as to a working basis had been reached and that several provinces had been outlined. Quickly following upon this announcement came the display, at the recent joint meeting of our Society and the Association, on April 14 and 15, of the completed map. Two maps, strictly speaking, were exhibited, one showing the eight major physiographic divisions of the country and their constituent twenty-two provinces, and the other, the twenty-two provinces and their eighty subdivisions, called sections. The number of the latter is an indication of the magnitude of the task which the committee faced, and that it should have solved the problem so successfully reflects great credit upon its members and its indefatigable chairman, Professor Fenneman, whose previous extensive researches greatly facilitated the prompt completion of the undertaking. The map, which will at once be accepted as the standard representation of its kind, will shortly be published and made generally accessible, possibly through the U. S. Geological Survey.

**Resumption of Traffic in the Panama Canal.** The Panama Canal was reopened to traffic on April 15 with the passage of sixteen ships, seven bound for the Atlantic, and nine, including an army transport, for the Pacific. The waterway was blocked by slides in September (see January *Review*, p. 53) and has virtually been closed to traffic since. During this time the dredging fleet has removed a vast quantity of débris from the Gaillard Cut (formerly called the Culebra Cut) and has made the channel through the cut better than it ever was. It now has a width of 300 feet for a distance of a quarter of a mile and a maximum depth of approximately 35 feet.

Expert opinion as to the recurrence of slides and their prevention has just become available in the preliminary report of the committee appointed by the National Academy of Sciences at the request of President Wilson, a summary of which was published in the daily press of March 17. The preliminary report was prepared by Charles R. Van Hise, President of the University of Wisconsin, chairman; General H. L. Abbott, Corps of Engineers, U. S. Army; John C. Branner, professor of geology, Stanford University; Whitman Cross, geologist, U. S. Geological Survey; R. C. Carpenter, professor of mechanical engineering, Cornell University; Arthur P. Davis, chief of the Reclamation Service, Washington; John R. Freeman, consulting engineer, Providence; J. F. Hayford, dean of the College of Engineering, Northwestern University; and Harry Fielding Reid, professor of dynamic geology and geography, Johns Hopkins University.

"The committee looks to the future of the canal with confidence," the report declares. "It is not unmindful of the labor necessary to deal with the present slides, and it realizes that slides may be a considerable, but not an unreasonably large, maintenance charge upon the canal for a number of years; it also realizes that trouble in the Culebra district may possibly again close the canal. Nevertheless, the committee firmly believes that, after the present difficulties have been overcome, navigation through the canal is not likely again to be seriously interrupted. There is absolutely no justification for the statement that traffic will be repeatedly interrupted during long periods for years to come. The canal will serve the great purpose for which it was constructed, and the realization of that purpose in the near future is assured.

"The committee believes that some sliding ground will continue to enter the canal for several years to come, though in diminishing amounts. Any relatively inexpensive measures which tend to arrest the present active slides or which promise to reduce the charge against maintenance of the canal in the future are therefore fully warranted."

The committee believes that every available and practicable device should be used to divert precipitation from the area susceptible to slides. It suggests the following measures: (1) covering slopes with vegetation; (2) filling up the peripheral cracks that appear as warning signs, so that they will not intercept surface water; (3) drainage, both surface and tile, of undisturbed and threatened areas near the slides to prevent them from becoming unstable; (4) drainage of the slides themselves by a complete system of open drains which could carry the water away as directly as possible; (5) drainage by means of tunnels in a few special cases; (6) making a cut by sluicing in the East Culebra slide, starting at an appropriate point on the canal and diverging from it diagonally in a general southeasterly direction, in the zone of gentle slopes and in such a position as to reach the large pond which now exists on the slide.

**A Military Map of Northern Mexico.** A timely map of northern Mexico has just been received by the Society from the Pan American Union, Washington, D. C. It is entitled "Map of Sonora, Chihuahua, and Coahuila, Mexico" and is on a scale of 1:100,000, or about 16 miles to the inch. It was prepared by the War College Division of the General Staff in December, 1913, and was reproduced for the Pan American Union in 1914. It comprises all of Mexico—except the Gulf coastal plain—north of 26° N., i. e. the latitude of the city of Durango, together with southern Arizona and New Mexico and western Texas. The map is on the same scale as the official topographic map of Mexico published by the Comisión Geográfico-Exploradora, of which, however, only a small number of sheets have been published for this region (see the index map in the *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, opp. p. 434), so that the War College Division map constitutes the most detailed existing representation of the area. Lines of communication are very fully shown, as is natural in a military map. The great number of roads seems at first surprising for a region reputed so pathless as the Chihuahua desert, but it should be remembered that many of those represented—even the best of the three grades indicated—are but mere tracks. Indeed, closer examination shows that the road mesh in Chihuahua and Sonora averages forty or fifty miles across, as against about twenty in Sonora and five to ten miles in western Texas. The map is well suited to following the movements of the punitive expedition against Villa, all the places that have so far figured in the press despatches, Columbus, Hachita, Colonia Dublan, Casas Grandes, Babicora, Namiquipa, Guerrero, and Parral being indicated, together with much detail concerning mining centers, mountains, and railroads.

**Studies of Central American Lakes.** Four lakes situated on the Pacific slope of Central America, Amatitlan and Atitlan in Guatemala and Ilopango and Coatepeque in Salvador, were visited in February, 1910, by Chaney Juday. The account of his limnological observations is published in the *Transactions of the Wisconsin Academy of Sciences, Arts, and Letters* (Vol. 18, Part I, Oct., 1915, pp. 214-250). All lie near the middle of the north-tropical zone in a region which has a dry winter season from November to April and a wet season for the remainder of the year. They belong to the tropical class whose waters are disturbed throughout their entire depth but once a year. The purpose of the investigations was to obtain data on dissolved gases and net plankton content. Considerable interest was added to these researches by the situation of the lakes in volcanic regions.

It was found that no permanent stratification existed which would produce bottom stagnation of the water. The process of overturning and circulation takes place between the middle of November and the middle of December. As cool weather sets in the temperature of the upper layer of the water falls and convection currents are formed. The wind also produces circulation disturbances. This mixing of the water in winter produces a fairly uniform distribution of the dissolved gases and other substances held in solution. Water from the lower layers attains the surface and renews its supply of oxygen.

The plankton collected shows abundance and compares favorably in quantity with that of lakes in temperate latitudes. The greatest variety of forms was found in Lake Amatitlan, the shallowest of the four.

## SOUTH AMERICA

**Floods in the Argentine Territories.** The progress of southern Argentina may be said to be punctuated by the meteorological extremes, flood and drought, to which the semi-arid region is subjected. Indians living on the banks of the Rio Negro described extraordinary floods in the years 1845-47. In 1879 a section of General Roca's expeditionary force against the Pampas Indians was imperiled by flood near the fort that bears his name, and lower down the valley early settlers suffered much loss. A single *hacendado* is said to have lost 20,000 sheep. Twenty years later Trelew in the Chubut was swept away, and the Welsh colonists deprived of practically all they had gained by previous good harvests. Since the last date the Argentine government has been engaged upon measures for the control of flood waters. In 1910 work was commenced on the Neuquen barrage, the great project that is to accomplish not only the aforesaid purpose but by irrigation is also to open up to settlement the Rio Negro valley, one of the most fertile areas of the republic. However, in a recent issue of the *South American Journal* (Dec. 18, 1915) it is stated that the flood-resisting strength of the nearly completed dam has been called in question; a question not improbably suggested by a recent catastrophe in the Colorado valley, north of and hydrographically similar to the Rio Negro. The unprecedentedly heavy rains of a year ago broke down the natural dam that in a late geologic period had formed the Andean lake of Carrilauquen, a source of the Colorado. The released waters, amounting to 2,800,000,000 tons, precipitated themselves into the lower

valley and 350 miles away flooded the Neuquen railroad line to such a degree that traffic was suspended for more than a month and heavy expenses incurred on account of damage to stock and property. The incident is briefly described in the *South American Journal* of October 16, 1915, and the *Geological Magazine* of December, 1915.

**The Production of Cinchona: A Lost Industry of South America.** The history of South America's commerce in the "divine medicine" shows even more than the usual exigencies of tropical production. Introduced to Europe by the Countess of Chinchon in 1640, the bark owed its first exploitation to those indefatigable pioneers of South American industry, the Jesuits. Early production was confined to the forests of Loxa whence exportation proceeded through the port of Payta. Reckless destruction of the trees of the Ecuadorian *montaña*—Humboldt reported that 25,000 were destroyed in a single year—led to search elsewhere in the Spanish domain (Quinine: A South American Gift to Humanity, by Edward Albes, *Bull. Pan Amer. Union*, Jan., 1916). Recovery from the period of depression incident on the Wars of Independence led to a remarkable development in the Peruvian *montaña*. In the mid-nineteenth century cinchona held the prominent place now occupied by rubber. Tribes of the lower *montaña*, from whom the *cascarilleros* were recruited, as are the *caucheros* of today, are said to date their chronology from the days of the "Great Quina." The government establishment of cinchona as a monopoly, with attempt to rule the prices on the European market, led to crises, failures, and endless legislation but stimulated production. High prices immediately caused a search for new forests. Such were found and stripped in the Bolivian *yungas*. In the first year after the creation of the monopoly the bark arriving in La Paz was nearly three times the amount legally available for export—7,000 quintals, an amount likewise exceeded by contraband export from the ports of Arica and Islay (Weddell: *Bolivie et Pérou*, Paris 1853; Favre-Clavairoz: *La Bolivie, Revue Contemporaine*, Paris, 1857). The introduction of the cinchona species into Java by the Dutch and into India and Ceylon by the British Government through Sir Clements Markham was the death blow to the South American industry. In 1882 Peru and Bolivia still exported as much as 8,900,000 pounds, about half the world's supply, but from that date the decline became rapid, and the present exportation is a negligible feature of their commerce. The wild forest product of a region almost devoid of means of communication and ill supplied with labor could not compete against carefully cultivated and accessible plantations in lands of abundant labor. But the present war is introducing new features into the world trade in quinine. The neutral nations are finding themselves practically cut off from the great markets of the East. Before the outbreak of the war the drug was sold at 20 cents per ounce; at the beginning of the current year the price had risen to \$1.50, with prospects of going indefinitely higher. The situation calls attention back to the still undeveloped possibilities of the original home of the product. In recent years only spasmodic efforts have marked the industry in Peru and Bolivia. At Cuzco and La Paz a rather pretentious company was organized in 1911 for the exploitation of *cascarilla* in the Urubamba Valley in the little-known region of the "Great Bend" ("The Cañon of the Urubamba," by Isaiah Bowman, *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, pp. 881-897), but the lack of Indian (Machiganga) labor, the enormous difficulties of transportation, and the scarcity of plants brought disaster, and the field party turned to the rubber industry with quite as little success.

#### AFRICA

**The Development of African Railways.** Sir Charles Metcalfe, long connected with the work of Cecil Rhodes in South Africa as engineer of railway construction, has written a paper (Railway Development of Africa, Present and Future, *Geogr. Journ.*, Vol. 47, 1916, pp. 3-21, with map, 1:20,000,000) presenting many facts as to the origin and development of railway enterprises in Africa, beginning with 1857, when the first line, 54 miles long, was built between Cape Town and Wellington. Commercial, political, and military considerations have been the main factors in railway building. No routes were extended far into the interior of South Africa till diamonds were discovered at Kimberley and gold in the Witwatersrand district, where Johannesburg now stands. Cape Town and the rival seaports of Port Elizabeth, East London, and Durban competed for the Johannesburg trade, and all built lines that put them in touch with this gold mining center. Then President Kruger, of the Transvaal Republic, was influential in securing a rail route between the Portuguese port of Lourenço Marques on Delagoa Bay and Johannesburg; and Cape Colony supplied some of the money for it.

The track gage of three feet and six inches, still used in the Union of South Africa, is, in the opinion of Sir Charles, a great handicap to trade and development, for the distances are great and the narrow-gage speed is only half that on the standard-gage roads of Europe.

Among the many railway achievements which Sir Charles briefly describes are the lines from Daressalam, the capital of German East Africa, to Lake Tanganyika, 778 miles long, completed in February, 1914, at a cost of \$35,000,000; the Shire River Railway, extended in 1914 from Blantyre in the British Nyasaland Protectorate to Chinde, the ocean port of the Zambezi River; the British East Africa Railway from Mombasa on the Indian Ocean to Victoria Nyanza, 582 miles; the branch extended from this line to Lake Magadi solely to tap its enormous soda resources; the great military line built by Kitchener in 1897 from Wadi Halfa through the desert across the bend of the Nile to Abu Hamed, extended to the Atbara in 1898, to Khartum in 1899, and later to Sennar on the Blue Nile and across the White Nile to El Obeid in Kordofan; and the line from the Atbara to Port Sudan, giving the Egyptian Sudan an all-rail outlet to the Red Sea. Turning to the Atlas region, Tunis has 1,144 and Algeria 2,298 miles of railway, chiefly coast lines with branches to or toward the desert; and when the war began, railways were making remarkable progress in Morocco towards Fez and Marrakesh.

Sir Charles says that, as a rule, it has been difficult to raise funds for railroad enterprises. River steamers have therefore been used as far as possible, railways working in conjunction with them. As trade increases, the railways will be made continuous, the rivers still being used as feeders. The railways that are being pushed steadily forward from the coast into the center of Africa will some day inevitably connect with the great trunk line passing north and south through the continent.

Cecil Rhodes, he says, never despised any great region, however uninviting it might appear, and his eyes were always fixed on the great territories north of Cape Colony. The railroad he conceived has now been built north as far as Bukama in the Katanga province of the Belgian Congo, 2,500 miles from Cape Town. A large part of it will form the southern section of the Cape-to-Cairo line (see note in the *March Review*, pp. 220-221), though Sir Charles does not use this name. In connection with this great enterprise, he speaks of the remarkable provision in the will of the late Alfred Beit, who bequeathed \$10,000,000 in trust for financing railways in Rhodesia. He desired the money to be expended in the building of railways that are necessary but cannot possibly pay for some years. Capital will come to their support as soon as they are on a paying basis, and the bequest will then be used again for other railways. It is hoped that the money will be used in building a railway from the station of Broken Hill in Rhodesia to Tabora in German East Africa, then north to Sennar on the Blue Nile. There the last rail on the Cape-to-Cairo route will be laid.

CYRUS C. ADAMS.

**The Trade of Lourenço Marques in 1914.** The trade of Lourenço Marques depends almost entirely upon the Transvaal, its natural commercial hinterland (*Diplomatic and Consular Repts.*, Ann. Series, No. 5558, London, 1916). Its activity comprehends three main phases—transit trade, in competition with Natal and the Cape; coaling trade; and trade as a recruiting center for the native labor employed on the Rand. Expenses and fees of the recruiting agency and gold brought into the country by the returned labor have contributed greatly to local prosperity. In 1913 the South African government decreed that no more labor should be imported from north of 22° S. latitude. As most of the Portuguese native labor comes from the province of Mozambique the blow has been severely felt. Endeavors are being made to substitute São Thomé as a field for contract labor under similar terms to those engaged in with the Transvaal. During the year 5,644 natives were dispatched to this destination. Other causes have contributed to produce the serious depression of the year—industrial disturbances in the Rand, prolonged drought, and, as a final crisis, the European war.

## AUSTRALASIA AND OCEANIA

**Weather Forecasts from Cirrus Cloud Directions in Australia.** A somewhat unique publication comes from the highly progressive and efficient Australian Bureau of Meteorology. It is a study by E. T. Quayle of the relations between cirrus directions as observed in Melbourne and the approach of the various storm systems affecting Victoria (*Bulletin No. 10*, 1915). The object of the investigation is to increase the accuracy of the official forecasts and also to enable persons in the country "to gage with some degree of probability the amount of rain likely to result during the passage of depressions of the various types." While general relations between cirrus movements and storms have, of course, been investigated by numerous meteorologists (in the United States, by the Blue Hill Observatory staff, under the direction of the late Prof. A. Lawrence Rotch; and by Prof. F. H. Bigelow, formerly of the U. S. Weather Bureau), we have no publication of practical use for the everyday non-professional observer which

is nearly as complete as the present volume. Mr. Quayle points out that the relations between cirrus directions and storm systems is twofold: (1) cyclonic systems of air circulation usually extend their influence to the cirrus level; (2) the general drift of the air at that level has an influence in determining the development and translation of cyclonic or other storm systems. The relation of cirrus movements and the various storm types is considered in detail. A considerable series of simplified weather maps shows the cirrus directions at Melbourne and the rainfall distribution in connection with all the different types of storms.

Light is thrown on the genesis of many Australian cyclonic disturbances. These are often preceded by an extensive flow of air, at cirrus level, from the tropical belt. At first this air movement is non-cyclonic and on a very extensive scale. A wide stream of air begins to move polewards, bodily, accompanied by increasing cloudiness, which leads to thunderstorms and widespread rains. This phenomenon may continue without cyclonic development until latitudes  $30^{\circ}$ - $35^{\circ}$  S. are reached. Then the increasing differential effect of the earth's rotation becomes manifest in the formation of a cyclonic circulation around a central low. The dynamic energy of the whirl often results in the early formation of a high-pressure ridge across the barometric valley previously connecting it with the tropical low-pressure belt. From this time on, the rainfall is controlled by the cyclonic circulation. The cyclone then proceeds on its way eastward as an extra-tropical cyclone and finally merges in the great Antarctic low-pressure belt. The original latitudinal atmospheric movement results from the attempt to restore equilibrium, temporarily lost, between portions of the polar and equatorial belts. R. DEC. WARD.

**A Proposed Expansion of the Pastoral Industry of South Australia.** In 1914 the Geological Survey of South Australia organized an expedition to investigate the mining and pastoral prospects of the little-known region of the Musgrave and Everard Ranges (The Geology and Prospects of the Region to the South of the Musgrave Ranges, and the Geology of the Western Portion of the Great Australian Artesian Basin, *Geol. Survey of South Australia Bull. No. 5*, Adelaide, 1915). These ranges are residuals rising above peneplaned surfaces of ancient rock west of the "great artesian basin." Mineral prospecting is not easy, for much of the widespread level surfaces is cloaked with deep superficial deposits. Thus, while the mineral possibilities cannot be said to have been exhaustively examined, in so far as the reconnaissance went prospects are not encouraging. No trace of tin was encountered, and the evidences of gold and copper were scant in a region where, on account of transportation difficulties and restricted water supply, a deposit must be rich to have any economic worth.

Prospects for the pastoral industry are brighter. The vegetation is generally sufficient. The staple for stock is found in the good grasses of the valleys. Other areas offer supplementary resources that would prove invaluable during dry seasons. There are the coarse grasses of the sandy tracts, the rushes of the swampy depressions, the salt bush of the elevated stony plains, the hill porcupine grass, inedible in the main but affording a delicacy in its inflorescence. The industry is assured if sufficient water can be obtained. This factor depends entirely upon local meteorological conditions, for west of the Cretaceous artesian basin there is no assurance of underground water. Water is obtained from waterholes and shallow wells, the supply of which is known to vary greatly. Giles in the first exploration of 1873 reported Ferdinand Creek as a "perennial running stream." In 1895 its water was much reduced but still was sufficient to support 1,000 head of cattle. The 1914 expedition found no moisture even at the bottom of the sand of the stream bed. Other circumstances indicate the present as a period of exceptional drought. The Musgrave Range has been deserted by the natives, and everywhere the vegetation shows signs of exhaustion. On the other hand there exist evidences of recent floods and comparatively heavy rainfall. In one native camp a child of seven or eight years of age was pointed out as born in the year of a big and general flood. The region lies in the transitional zone between the belt of cyclonic storms and the monsoonal rains of the north. There is no rainfall record, but on the trans-continental telegraph line to the east the annual average (*Commonwealth Bur. of Meteorol. Annual Summary, 1910*) is about 5 inches. The summer monsoonal rain is the more important, and local residents say that 3 inches in the early summer is sufficient to maintain the industry satisfactorily for a year. In the two localities possessing wells sheep and cattle are thriving. Expansion of the industry must be preceded by the sinking of wells—as many as possible to conserve the neighboring pasture—in the restricted areas where the right surface conformation and rock structure for water catchment exist. Heretofore there has been no stimulus to expansion, but today the worldwide reduction in stock accentuated by the European war, the elimination of former competitors, and the improved facilities for shipment offer new incentive to the pastoral industry.

## POLAR REGIONS

**Return of the "Aurora" of the Shackleton Expedition.** Press despatches report the arrival on April 3, at Dunedin, New Zealand, of the *Aurora*, the ship which was to establish a base on the shore of Ross Sea for the members of Sir Ernest Shackleton's expedition on their arrival from Weddell Sea on the opposite side of the Antarctic Continent. The *Aurora* left Hobart, Tasmania, at the end of 1914. On January 9, 1915, she arrived at Cape Crozier, the eastern tip of Ross Island. Finding conditions too bad to permit landing, the *Aurora* sailed west around the island to Cape Evans, off which she anchored. From the end of January to the middle of March various expeditions ashore were made for the purpose of landing stores, arranging the depot, testing the motors, and doing scientific work. On May 6 during a violent blizzard the *Aurora* broke away from her moorings. There were then ten men ashore, including Lieutenant Mackintosh, the leader of the Ross Sea party, H. E. Wild, Ernest Joyce, J. Cope, A. Stevens, A. Spencer Smith, and Victor Hayward. The ship, with the remainder of the crew, then became blocked in pack ice and for over ten months drifted helplessly, covering about 500 miles in a general northerly direction along the coast of Victoria Land. On July 21, 1915, the ice pressure severely strained the hull and carried the rudder away. The vessel was then about 90 miles south of Coulman Island, which lies off the coast of Victoria Land in  $73\frac{1}{2}^{\circ}$  S. and  $170^{\circ}$  E., and only got away from the ice on March 14 last, in  $64^{\circ} 30'$  S. and  $161^{\circ}$  E., just north of the Balleny Islands. As soon as she was released, a steering gear was improvised and the course set for New Zealand, which was reached in three weeks, as stated above.

The forced departure of the *Aurora* leaves two parties in possible peril, the main transcontinental party under Shackleton and the shore party under Mackintosh. No news has been received from Sir Ernest since January, 1915, when he started south from South Georgia in the *Endurance* (*Bull. Amer. Geogr. Soc.*, Feb., 1915, p. 129). The ice then was so bad that he did not expect to cross the continent until the next Antarctic summer, beginning in October, 1915. If he succeeded, he will now be hoping to find supplies on descending from Beardmore Glacier, which Mackintosh's party will, however, hardly have been able to reach in their present isolation. If Shackleton is able to reach Cape Evans he will find there an abundance of food and fuel, but no clothing. This and the provisions landed from the *Aurora* also promise to maintain the Mackintosh party if they hold out through the approaching Antarctic winter until succor can reach them, in December, at the earliest.

## PHYSICAL GEOGRAPHY

**The Natural Region.** In a paper entitled "Natural Economic Regions" (read at the Chicago meeting of the Association of American Geographers, 1914, and printed in the *Annals* of the association, Vol. 5, 1915, pp. 121-125), Prof. Charles R. Dryer calls attention to the prime need of the geographer of today—the establishment of the "natural region." Man's changing and varied relations to his environment render the problem complicated in the extreme. The best method of approach appears to be by the economic interpretation. Economic influence affords a basis for the estimation of the relative values of the different factors entering into the complex. The natural economic complex is based fundamentally upon vegetation, functioning in part through animal media, and upon climate, itself the primary phytogeographic control. In the determination of the major natural regions physiographic controls are of subordinate importance. They operate indirectly through their effect on the two principal factors and are to be considered rather as important, often dominant, determinants in the subdivision of the major region.

**The Distribution and Origin of the Beech.** From Bukowina to Buckinghamshire are conserved place-name records of the important part the beech has played in the progress of Western civilization. Its employment by man dates back to Neolithic times in the Swiss lake dwellings. In medieval days it nourished alike hearth and forge and the herds of swine that contributed so largely to man's subsistence. Today the tough, strong wood of the beech finds many uses in the making of wooden ware. For such purposes the North American species is in demand as well as the European. The beech ranges from eastern North America through Europe and the Nearer East; two species occur in eastern Asia, and the range of the family is further extended by the presence in the southern continent of *Nothofagus*, the Antarctic beech, a genus very closely related to the northern beech (*Fagus*). From Chiloe to Tierra del Fuego the rainy Pacific slopes are clothed with dense forest in which the Antarctic beech predominates. In this region of equable but low annual temperature the beech species is characteristically small-leaved and evergreen in habit. These forests are practically unexploited. Un-

fortunately where the timber might be of greatest service—in the district of Punta Arenas—it is smallest and otherwise unsuitable for the purposes of lumbering. Utilization of the forest must await further settlement. Similar forests exist in New Zealand, and *Nothofagus* is also known in southeastern Australia.

This wide distribution arouses interest in the question of the origin of the beech (Notes on the Ancestry of the Beech, by Edward W. Berry, *The Plant World*, Vol. 19, 1916, No. 3). The earliest recorded forms appear practically simultaneously in Europe and North America, the one in the Cenomanian of Saxony and the other in the Dakota Sandstone of the western United States, whence is argued their common origin in some third region, presumably Asiatic or Arctic. Present evidence favors the former. The beech has not been found in the Cretaceous of Greenland, though it appears in the Tertiary, and it apparently did not take part in the Cretaceous migratory wave that passed along the eastern coast of North America. Assuming an Asiatic origin, waves would spread westward to Europe and eastward through Alaska and southward to the southern continent, where it is known in the early Tertiary, through Antarctica—it occurs in Graham Land—to New Zealand and perhaps Australia, though Australia may have got its forms via southeastern Asia. The northern origin of the Antarctic form is strengthened by the discovery of *Nothofagus* in European Tertiary deposits, in the Oligocene of Greece.

### HUMAN GEOGRAPHY

**The Fate of Primitive Races.** With few exceptions the contact of races differing widely in civilization has resulted in the decline of the inferior. Much of the explanation lies in the operation of "the law of struggle and work." Too often the higher civilization, simply destructive, has eliminated native habits of work without providing substitute forms. In primitive societies division of labor usually allots cultivation and the handicrafts to the women: men's work is war. The advent of the trader, missionary, settler, and the government intervening for their protection means that war must cease. The men are left with idle hands. In the eastern islands of Malaysia, for instance, although the shock of actual contact with the white intruder has been little experienced, the work-destroying cause has operated from a distance. The tribes are diminishing. The sago-palm offers too easy a livelihood for peoples deprived of their old-time exercise of war. There are, however, some notable examples of the success attending the introduction of suitable work. Not long ago it was predicted that the Maori would soon be extinct as his brother Tasman, but the development amongst the race of farming and sheep-shearing during the last twenty years has reversed the current of decline. All-saving labor has likewise arrested the sterility that threatened to obliterate the natives of the southern New Hebrides (Aboriginal Decay in the Pacific Ocean, by J. Macmillan Brown, *Journ. of Race Development*, Vol. 6, 1916, No. 3). In the southwest of the United States the unspoiled Navajo flourishes, a remarkable exception to the common fate of the North American Indian (see "The Navajo Country," Pt. II, by H. E. Gregory, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, No. 9, and "Record" item, "The Navajo Indian in Relation to the State" in the same number; also "The Era of Indian Demoralization," by Archer B. Hulbert, *Journ. of Race Development*, Vol. 6, 1916, No. 3). Stefansson has shown the destructive influences at work amongst the demoralized Eskimo, and analogous illustrations come from the southern extreme of the continent. In less than half a century the Yahgan Indians of the Ushuaia missions were reduced from several hundreds to a bare handful. The Pampas Indian has gone, and the Patagonian is following him. With their decay one may contrast the historic achievement of the Jesuit Fathers in the Paraguay missions, where, as a motto, work held equal place with obedience.

### EDUCATIONAL GEOGRAPHY

**Report on School Map Material.** At the meeting of the British Association in Manchester last September the Committee on Atlas, Textual, and Wall Maps for School and University Use made a report which is printed in the *Scottish Geographical Magazine* for November (pp. 574-577). The substance of the report follows:

Where both orographical and political maps of one region are provided only names of physical features should appear on the orographical map. The color scheme adopted for the International Map in 1:1,000,000 should be followed as closely as possible for all physical maps. For the sea deepening shades of blue should be used, with depths in feet; for lakes the same blue as for the shallowest sea; also blue for rivers and river names, and red lines for political frontiers on an orographical map. Colors indicating relief should not be interrupted at the frontier but carried to the margin of the map.

Few varieties of projection should be used in a school atlas. For hemispheres, Clark's

minimum error projection is best; the globular projection is to be avoided. For continents and larger countries, the zenithal equal-area projection should be used; for smaller countries, a simple conical development. Mercator's projection should be excluded from the body of a school atlas, though it may effectively be employed as an index sheet. Hemisphere maps should be much more freely employed as they are the most accurate representation, except the globe, of the earth's surface. Where practicable, they should be used to exhibit world distributions of all kinds. The scales employed should be few and as a rule simple multiples one of another. On each map the scale should be plainly stated. In the margin should be indicated other towns in the same latitude and also (on maps of wide extent) the area of a quadrilateral of the network.

The few recognized conventional signs are sufficient, except to indicate any new feature such as a first-class wireless station or the employment of river water for power or irrigation. The limit of navigation may be shown by an anchor. The solid black dot for town sites is better than the fine open circle, as more clearly revealing concentration of urban population. Larger towns require a larger dot or a dot within a circle.

Words or conventional signs indicating the distribution of economic production are deprecated. If economic factors must be shown on a general map, solid color or shading should be used to indicate the concentration of industrial population or the locality of two or three commodities of first importance.

Black-and-white maps in school books (textual maps) should not supersede atlas maps but should be confined to illustrating statements in the text. A textual map must be simple and should not attempt to show large detail. Features tending to mutual obscuration should not be shown on the same map.

The recommendations of the Committee in regard to the style of a school atlas apply almost without modification to all wall maps. The scales, however, should be as few as possible and should be simple multiples of each other. The far larger scale of a wall map is no excuse for the introduction of minute detail or a crowd of names. A wall map is essentially a diagram. The use of wall maps without names or with only a few names or initials is greatly to be encouraged. Color both in atlas and wall maps shows relief better than contours. The wall map is intended to supplement but not to replace the atlas. Most wall maps fail by attempting too much.

## GEOGRAPHICAL NEWS

### PERSONAL

DR. JOSEPH BARRELL, professor of structural geology in Yale University, delivered during March a series of lectures on the "Nature and Bearings of Isostasy" before the department of geology of Columbia University.

SIR S. G. BURRARD, Surveyor-General of India, at the third Indian Science Congress which met at Lucknow on January 13-15 read a paper on "The Plains of Northern India and Their Relationship to the Himalaya Mountains."

MR. GEORGE K. CHERRIE, who accompanied Colonel Roosevelt as an ornithologist on his Brazilian expedition of 1914, gave a lecture at the American Museum of Natural History on March 17 and at Public School No. 19 of the Borough of the Bronx on April 4, entitled "With Colonel Roosevelt on the River of Doubt."

PROF. FREDERICK E. CLEMENTS, of the department of botany of the University of Minnesota, spoke on "The Story of the Forest" before the Forestry Club at the New York State College at Syracuse University on December 16.

PROF. HENRY C. COWLES, of the department of botany of the University of Chicago, spoke on "The Vegetation of the United States as Influenced by Glacial Action" before the Forestry Club at the New York State College of Forestry at Syracuse University on March 2.

DR. J. D. FALCONER, lecturer in geography at the University of Glasgow, has been appointed temporary assistant district officer in the northern provinces of Nigeria.

PROF. B. E. FERNOW, of the University of Toronto, spoke on "The Birth of a Forest Policy" before the Forestry Club at the New York State College of Forestry at Syracuse University on January 27.

PROF. GEORGE I. FINLAY, of the department of geology of New York University, spoke on April 17 before the New York Academy of Sciences on "The Geology of North Park, Colorado."

DR. A. A. GOLDENWEISER read a paper on March 27 before the New York Academy of Sciences entitled "Notes on the Social Organization of Melanesia."

PROF. A. W. GRABAU, of Columbia University, spoke on April 17 before the New York Academy of Sciences on the "Geology of the Island of Gotland in the Baltic Sea."

PROF. LYMAN B. HALL, professor of English and American history at Oberlin College, will give a course on the "Physical, Political, Commercial, and Historical Geography of England" at the coming summer session of the college.

MR. FRANCIS HARPER, lately of the Brooklyn Institute Museum, has been appointed to make a detailed study of the fisheries of Oneida County, New York, as a basis for scientific working plans for fish stocking and protection.

MR. EDMUND HELLER, naturalist, has joined the zoölogical expedition to southern China conducted by Mr. Roy C. Andrews under the auspices of the American Museum of Natural History (see the April *Review*, p. 308). Mr. Heller will be remembered as a joint author with Colonel Roosevelt of a valuable contribution to the zoögeography of Africa entitled "Life Histories of African Game Animals" which was reviewed in the March, 1915, *Bulletin of the American Geographical Society* (pp. 190-192).

PROF. WILLIAM H. HOBBS, of the University of Michigan, has been elected President of the Michigan Academy of Sciences for the current term of office.

PROF. GEORGE D. HUBBARD, of the department of geology of Oberlin College, will give a course on field geology during the coming summer session. The region selected is in southern Vermont near the Deerfield River.

PROF. DOUGLAS W. JOHNSON, of Columbia University, on April 11 before the teachers of Dayton, Ohio, repeated his lecture on "The Influence of Topography on the European War."

DR. WILLIS T. LEE, of the U. S. Geological Survey, gave an illustrated lecture on April 7 at Lehigh University on "Camp Life of a Geologist in the Rocky Mountains."

PROF. LAWRENCE MARTIN, of the University of Wisconsin, on April 19 gave the Heilprin Memorial Lecture before the Geographical Society of Philadelphia. His subject was "The Gorge of the Upper Mississippi as a Rival of the Rhine Gorge."

MISS MAJORIE O'CONNELL read a paper on April 17 before the New York Academy of Sciences entitled "Notes on the Geology of Oesel in the Gulf of Riga."

MR. WILFRED H. OSGOOD, of the American Museum of Natural History, spoke on April 28 before the Geographic Society of Chicago on "The Fur Seals and Other Animals of the Pribilof Islands."

PROF. GEORGE B. ROORBACH, of the University of Pennsylvania, lectured on April 5 before the Geographical Society of Philadelphia on "Venezuela, Our Nearest South American Neighbor."

GENERAL JULES M. DE SCHOKALSKY, who, it will be remembered, was a member of the Society's Transcontinental Excursion in 1912, has been elected an honorary member of the Italian Royal Geographical Society.

PROF. ROLLIN D. SALISBURY, of the University of Chicago, lectured on April 14 before the Geographic Society of Chicago on "Porto Rico."

MR. J. WARREN SMITH, head of the Columbus (Ohio) station of the U. S. Weather Bureau for eighteen years and professor of meteorology at the Ohio State University, has been promoted to be Chief of the Division of Agricultural Meteorology, with headquarters in Washington.

MR. DAVID T. THOMPSON, instructor in geology in Goucher College, will give a course on "Physical and Economic Geography" during the coming summer session at Johns Hopkins University. The course will deal with the general principles of the subject and with their application to the European War and to the United States.

DR. O. H. TITTMAN, president of the National Geographic Society and formerly superintendent of the U. S. Coast and Geodetic Survey, has been elected a vice-president of the Washington Academy of Sciences for the year 1916.

DR. CHARLES R. VAN HISE, President of the University of Wisconsin, lectured on March 17 under the auspices of the Sigma Xi Society at the University of Minnesota on "The Panama Canal, with Especial Reference to the Slides." President Van Hise is chairman of the commission appointed at the request of President Wilson by the National Academy of Arts and Sciences to investigate the slides, and returned some time ago from a trip to Panama (see also, above, the note on the "Resumption of Traffic in the Panama Canal").